Fine Perceptive GANs for Brain MR Image Super-Resolution in Wavelet Domain

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Abstract

Magnetic resonance imaging plays an important role in computer-aided diagnosis and brain exploration. However, limited by hardware, scanning time and cost, it's challenging to acquire high-resolution (HR) magnetic resonance (MR) image clinically. In this paper, fine perceptive generative adversarial networks (FP-GANs) is proposed to produce HR MR images from low-resolution counterparts. It can cope with the detail insensitive problem of the existing super-resolution model in a divide-and-conquer manner. Specifically, FP-GANs firstly divides an MR image into low-frequency global approximation and high-frequency anatomical texture in wavelet domain. Then each sub-band generative adversarial network (sub-band GAN) conquers the super-resolution procedure of each single sub-band image. Meanwhile, sub-band attention is deployed to tune focus between global and texture information. It can focus on sub-band images instead of feature maps to further enhance the anatomical reconstruction ability of FP-GANs. In addition, inverse discrete wavelet transformation (IDWT) is integrated into model for taking the reconstruction of whole image into account. Experiments on MultiRes_7T dataset demonstrate that FP-GANs outperforms the competing methods quantitatively and qualitatively.